

# ME571/Geol571 Geology and Economics of Strategic and Critical Minerals

## Safety

Sources: Colorado Mine Safety  
and Training Program.  
Molycorp Inc., MSHA, OSHA

**Should you be committed to  
Safety?**

**100 % of the time?**

**On an average day in  
America...**

**5,937 Americans die!**

**24,384 Americans suffer disabling injuries  
from accidents**

**4,932 Americans are injured in work related  
accidents**

**OF THESE...**

**82 are injured in mining accidents**

**438 are injured in agricultural accidents**

**521 are injured in construction accidents**

**822 are injured in manufacturing accidents**

**On an average day...**

**1 American is injured by lightening**

**35 are injured by fireworks**

**68 are injured playing golf**

**104 are injured while shaving**

**153 are injured using lawn mowers**

**307 are injured in the bathtub or shower**

**56,061 Americans drive a car after drinking alcohol**

# On an average day...

**133** Americans will die in an automobile accident of which **71** will be related to alcohol consumption

**30** will die in falls

**13** will die from fires and burns

**11** will die from poisoning

**10** will die from suffocation from ingested objects

**5** will die from firearms accidents

**2** will die from asphyxiating gases or vapors

**On an average day...**

**30 Americans will die from**

**work related accidents**

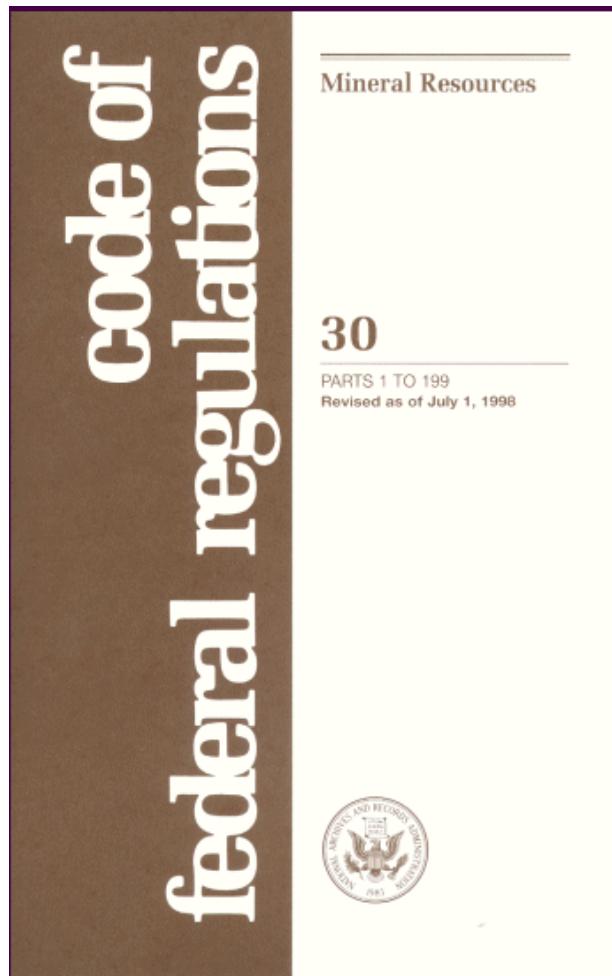
**The question is:**

**Should you be committed to  
Safety 100% of the time?**

"IT'S BETTER TO BE CAREFUL  
A HUNDRED TIMES  
THAN TO GET KILLED ONCE."

*MARK TWAIN*

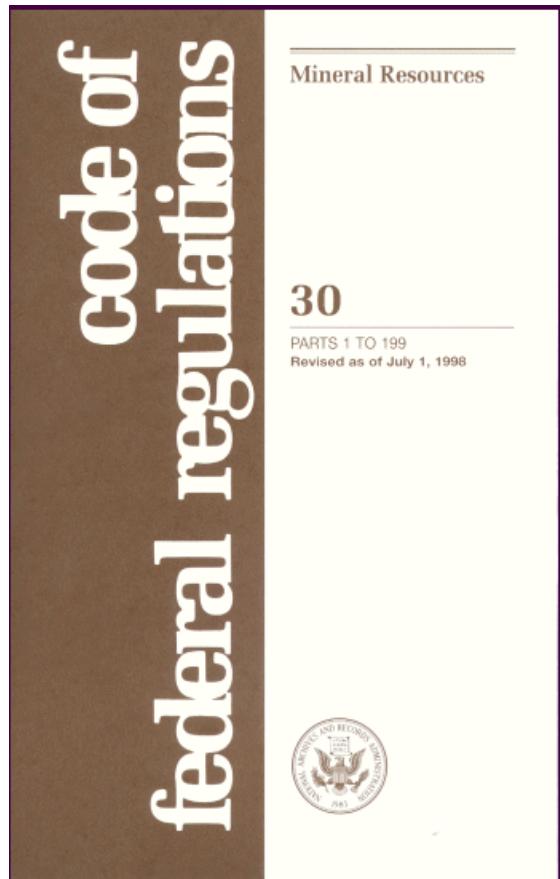
# Mandatory Health and Safety Standards



- MSHA
- OSHA
- NIOSH
- State agencies



# Mandatory Health and Safety Standards



**Can anyone answer  
the question:**

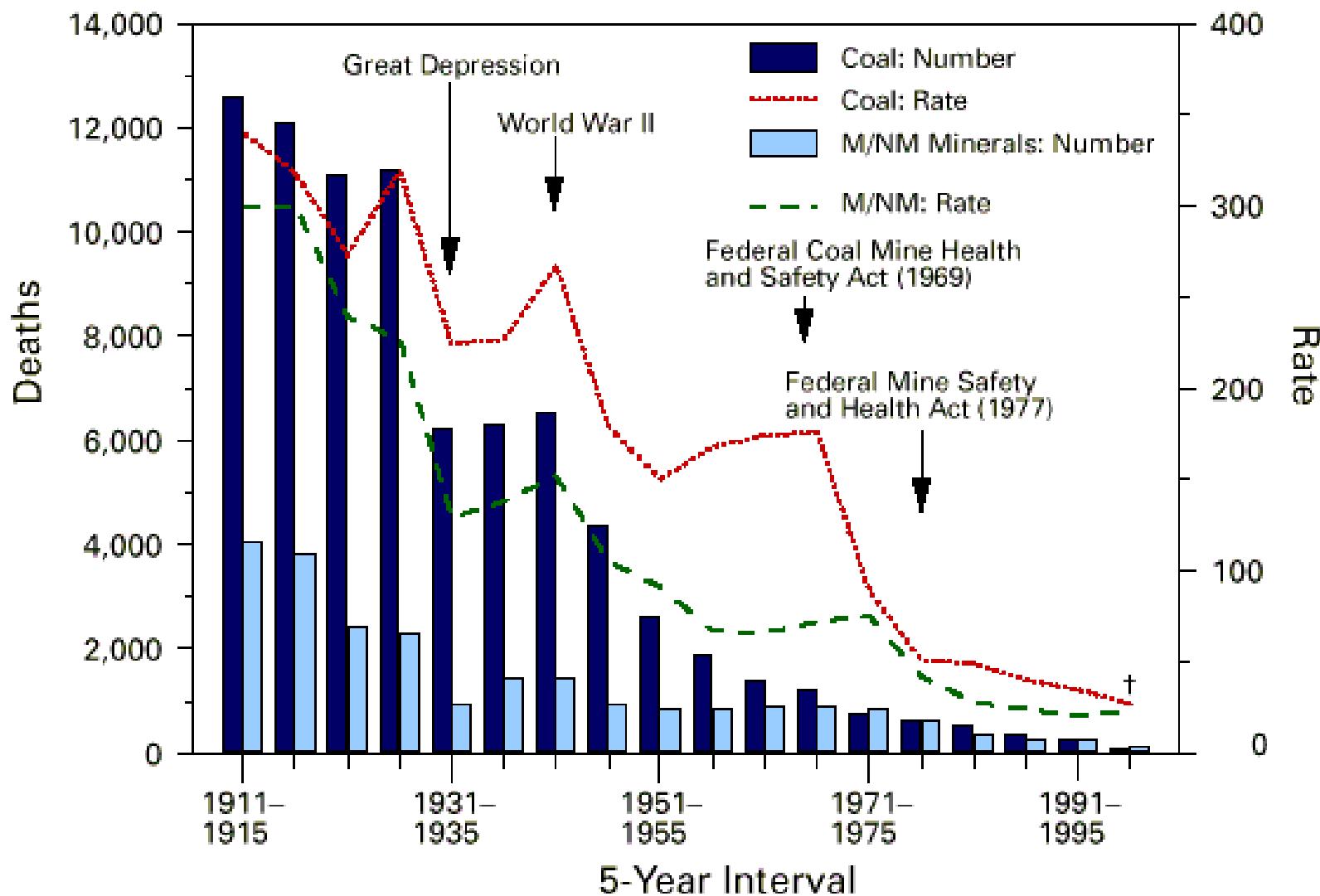
**Why do we have  
mining regulations?**

# A Brief History Lesson

**Some miners believe that all regulations are written in **Blood**.**

**Underground mining disasters involving multiple fatalities have been the fuel, igniting legislation, that governs how we mine today.**

**FIGURE 4. Number of deaths and fatality rates\* in mining coal and metal/nonmetallic (M/NM) minerals, by 5-year interval — United States, 1911–1997**



\*Per 100,000 workers.

†Data are for 1996 and 1997.



NIOSH Publication No. 2006-152:

## NIOSH Fatal Occupational Injury Cost Fact Sheet: Mining

Number, rate, and costs of fatal occupational injuries in the U.S. mining industry by selected characteristics, 1992–2002

Characteristic	Number of fatalities	Fatality rate (per 100,000 workers)	Costs (2003 dollars)		
			Total (millions)	Mean (thousands)	Median (thousands)
All incidents	1,721	26.0	\$1,788	\$1,039	\$1,064
Sex:					
Male	1,700	29.9	1,768	1,040	1,066
Female	21	2.2	20	942	962
Race of decedent:					
White	1,594	25.7	1,657	1,039	1,065
Black	62	22.1	66	1,070	1,063
Other*	65	45.8	65	999	1,003
Age of decedent:					
16–19	33	37.8	30	905	959
20–24	156	40.3	165	1,055	1,075
25–34	422	29.7	500	1,185	1,192
35–44	509	20.5	623	1,223	1,250
45–54	386	24.6	379	983	978
55–64	155	27.6	86	556	563
65+	60	54.6	5	89	70

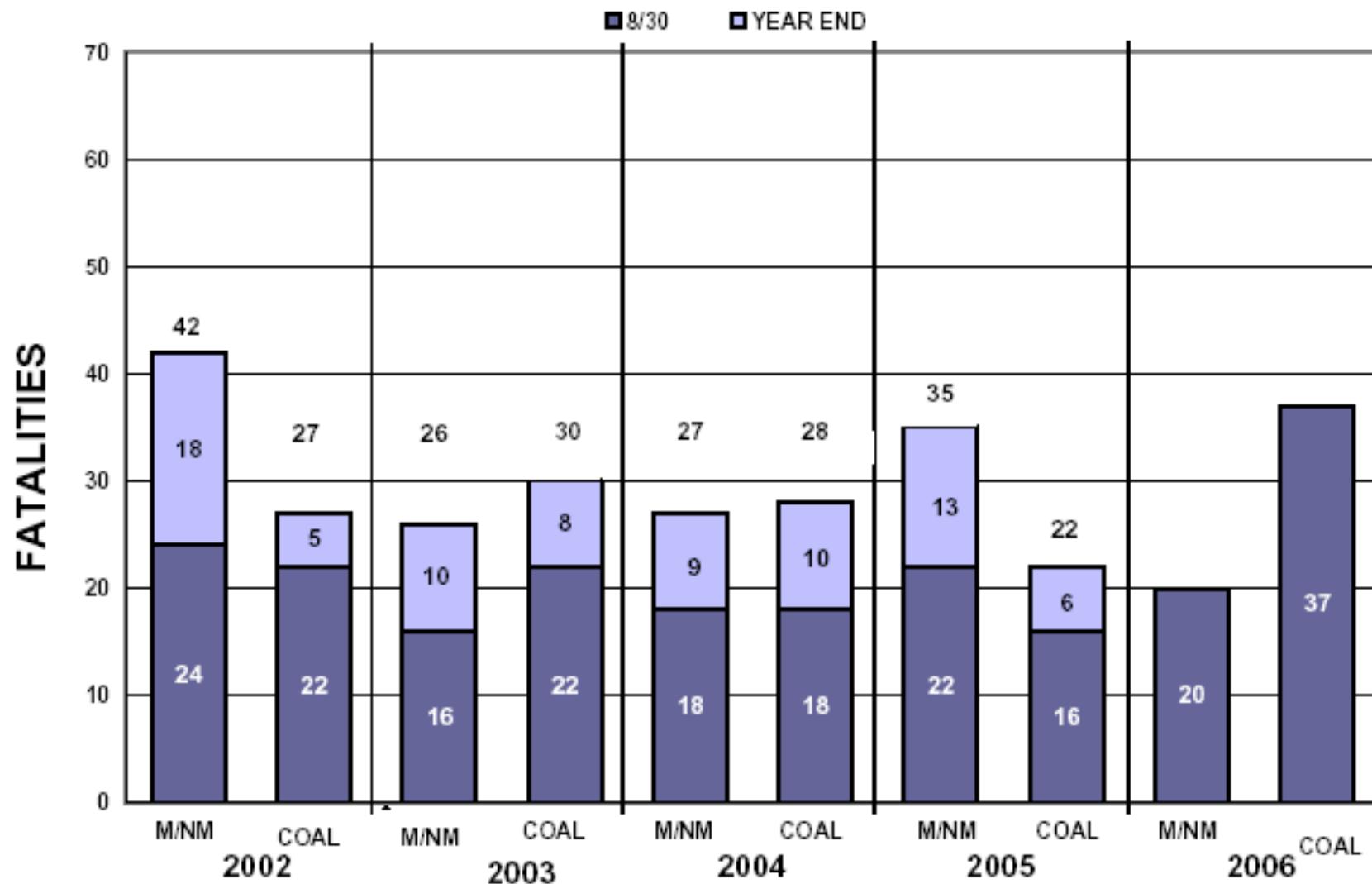
# Mine fatalities in 2006

- **72 as of 12/31/06**
- **47 in coal mines (12/31/06)**
- **25 in metal/nonmetal mines (12/31/06)**

# Mine fatalities in 2007

- **5 as of 1/30/07**
- **3 in coal mines (1/30/07)**
- **2 in metal/nonmetal mines (1/30/07)**

## COMPARISON OF YEAR-TO-DATE AND TOTAL FATALITIES FOR M/NM & COAL

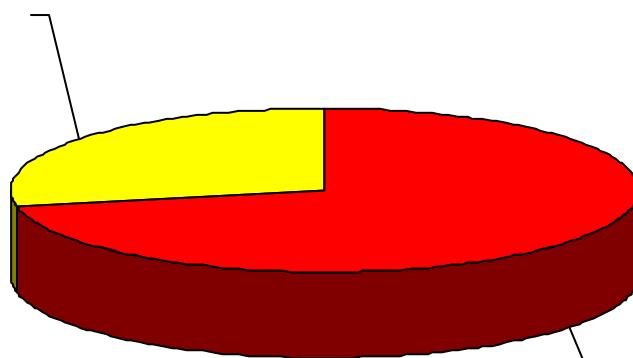


**Metal and Nonmetal  
Fatal Accident Review  
CY 2005**

# MNM Fatal

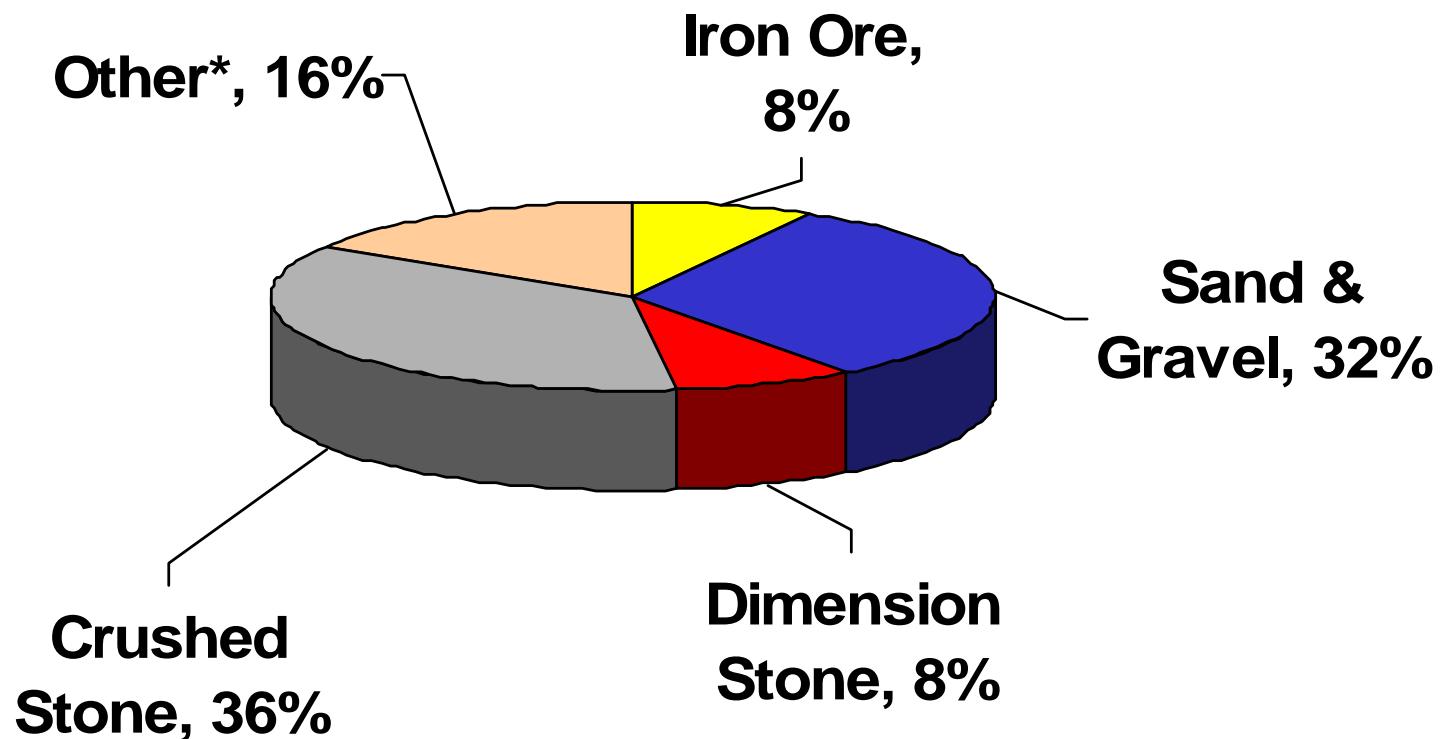
Contractors

7



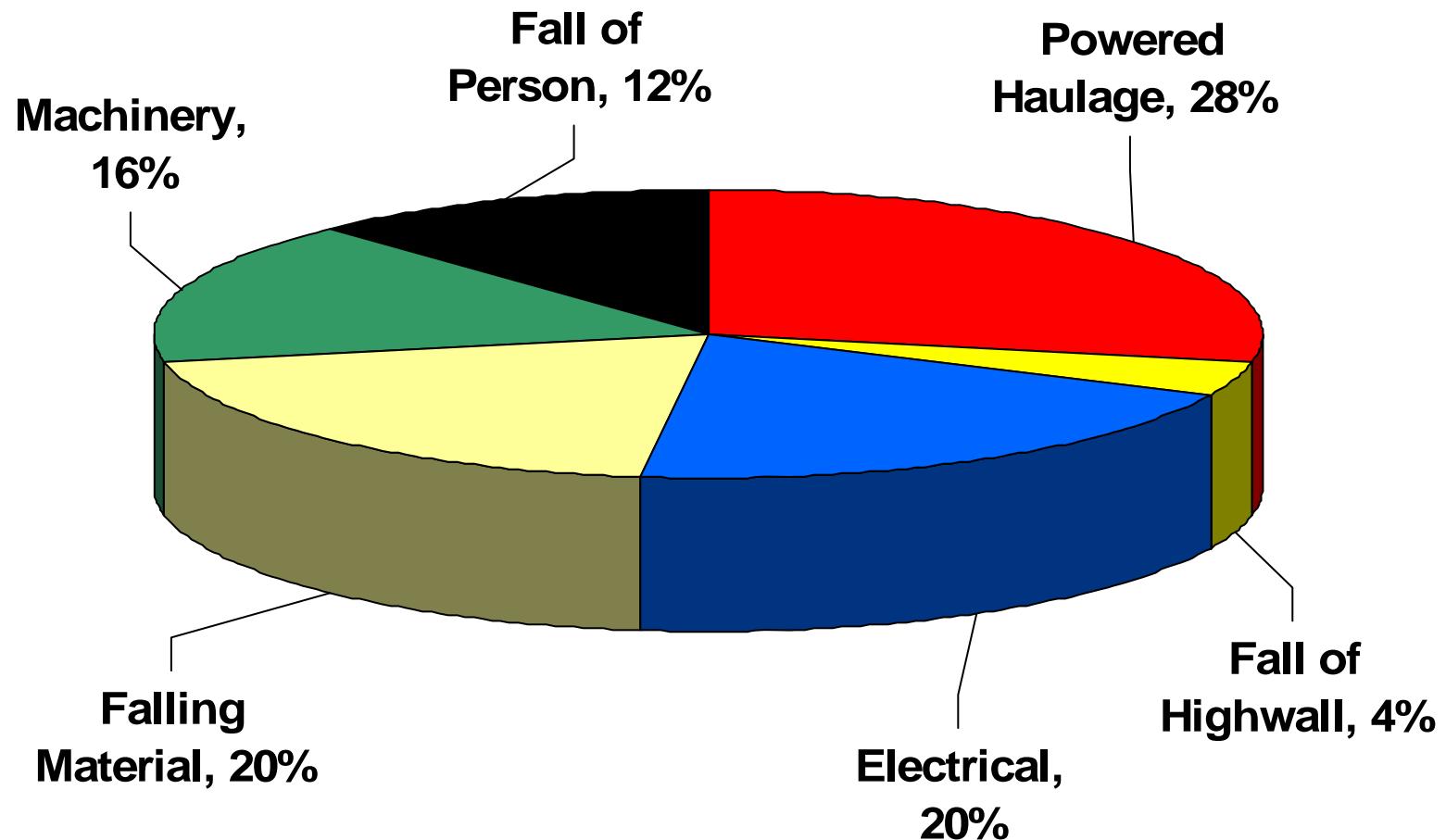
Mine  
Employees  
18

# MNM Fatalities by Commodity

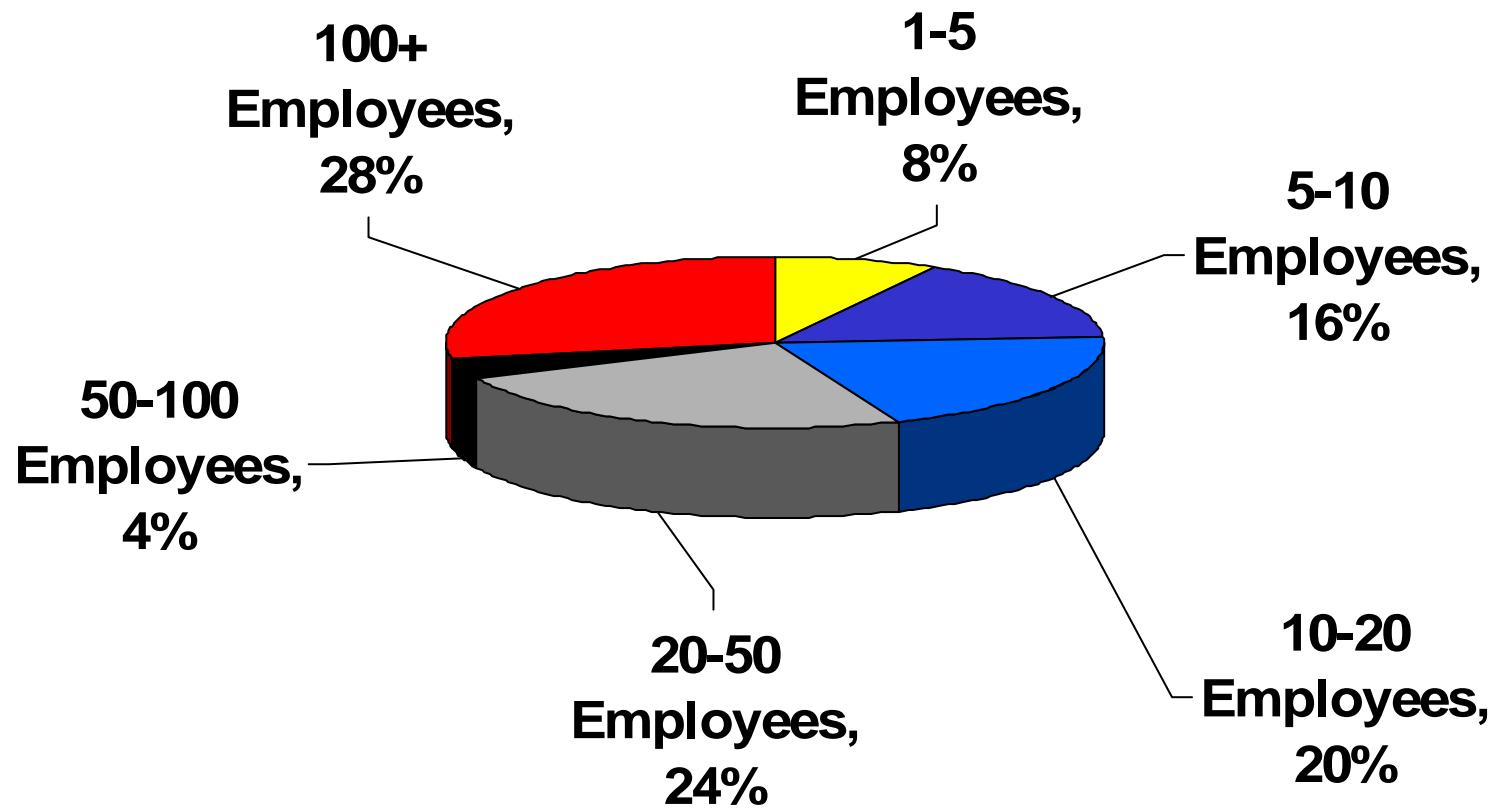


\* Trona, Lime, Platinum, Pumice, Phosphate, Iron Ore, Sandstone, Potash, Copper

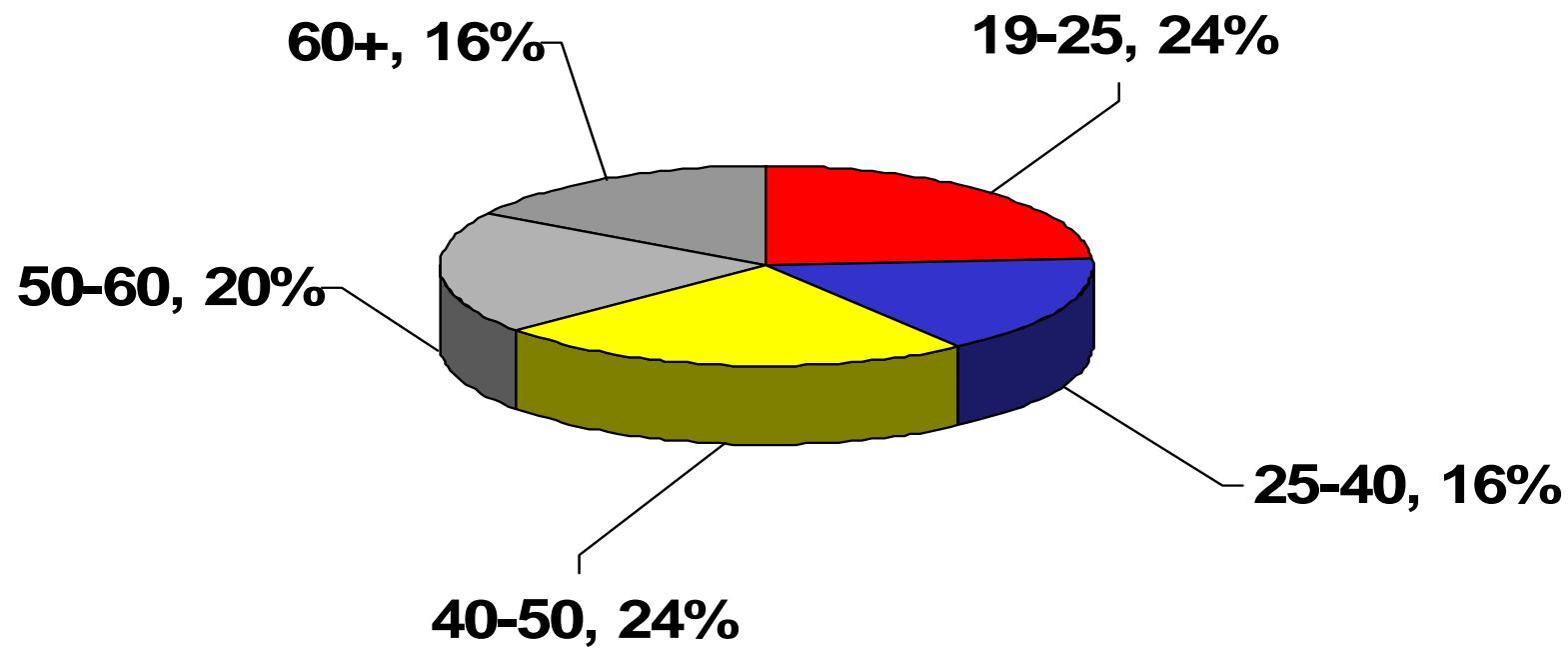
# MNM Fatalities by Classification



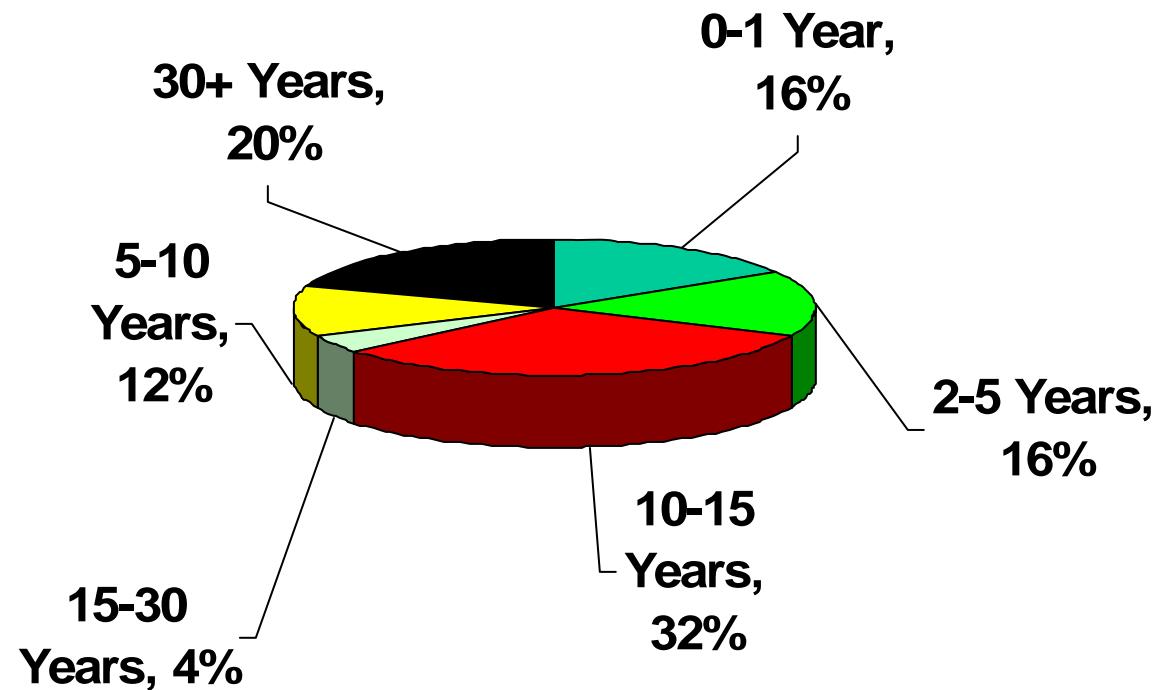
# MNM Fatalities by Mine Size



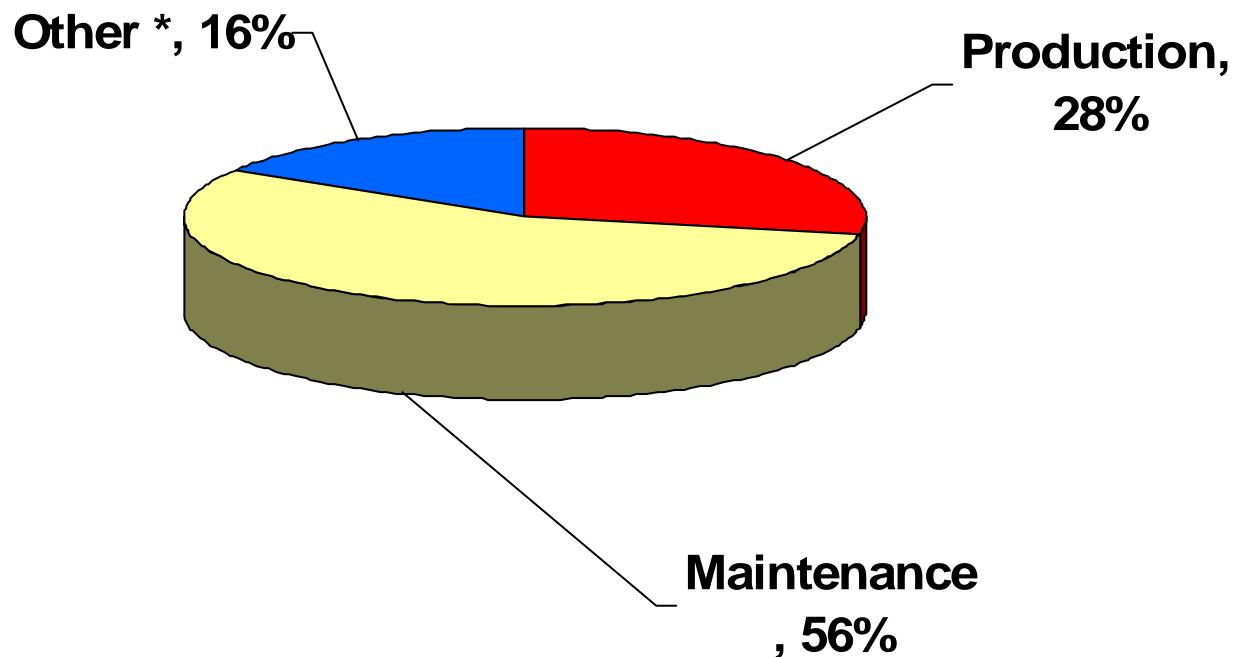
## MNM Fatalities by Age



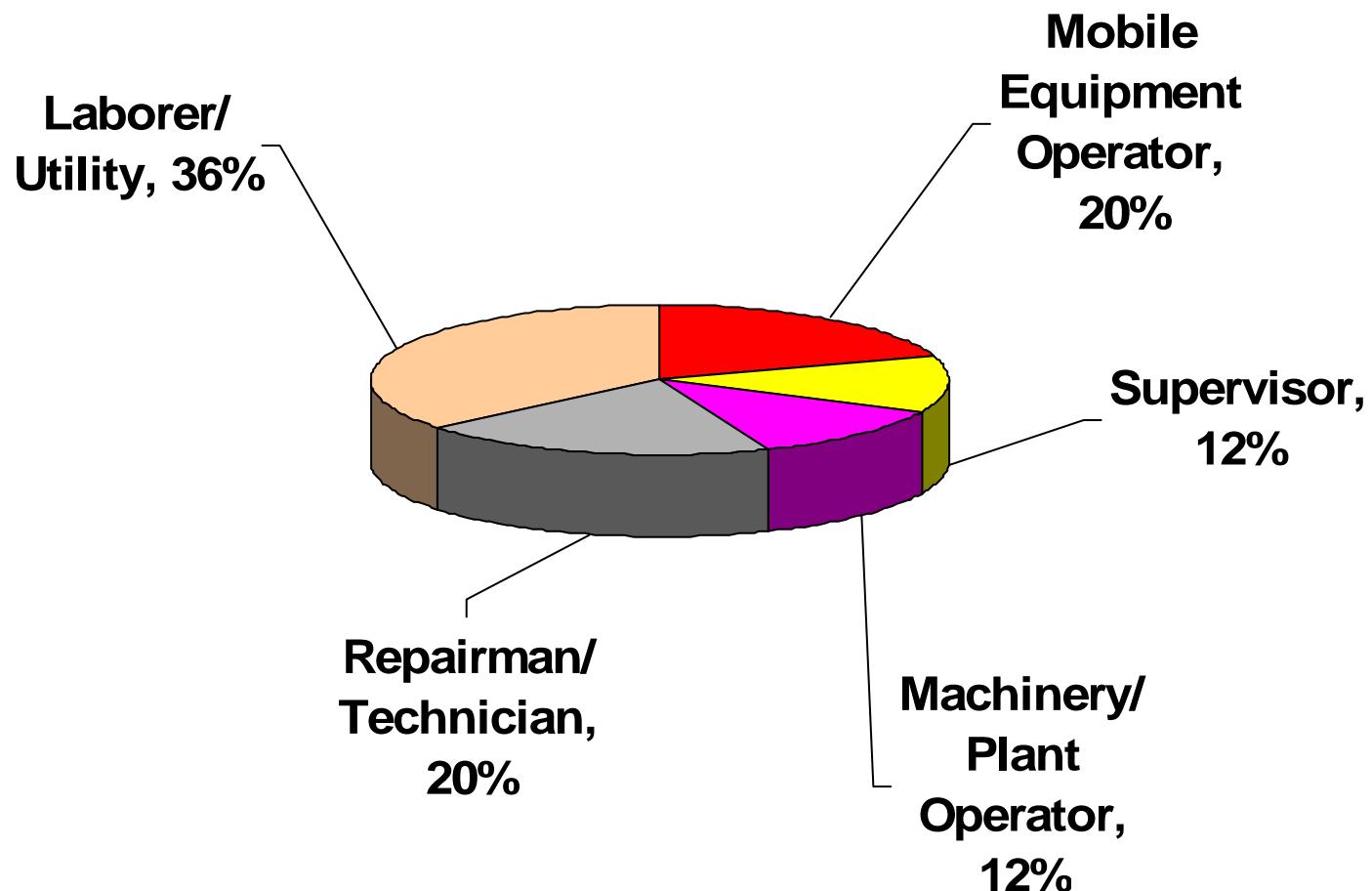
# MNM Fatalities by Mining Experience



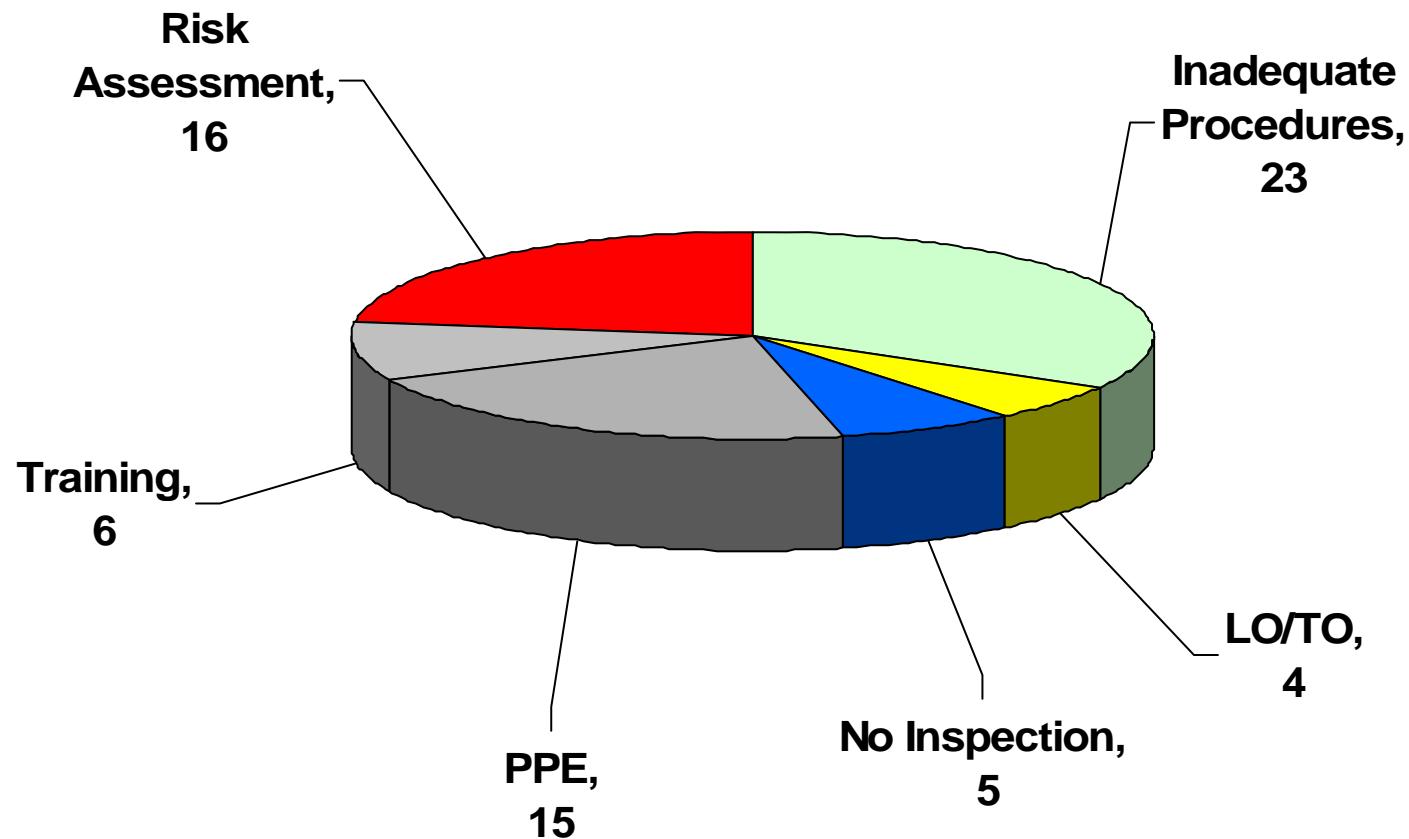
# MNM Fatalities by Activity



# MNM Fatalities by Occupation



# Root Causes

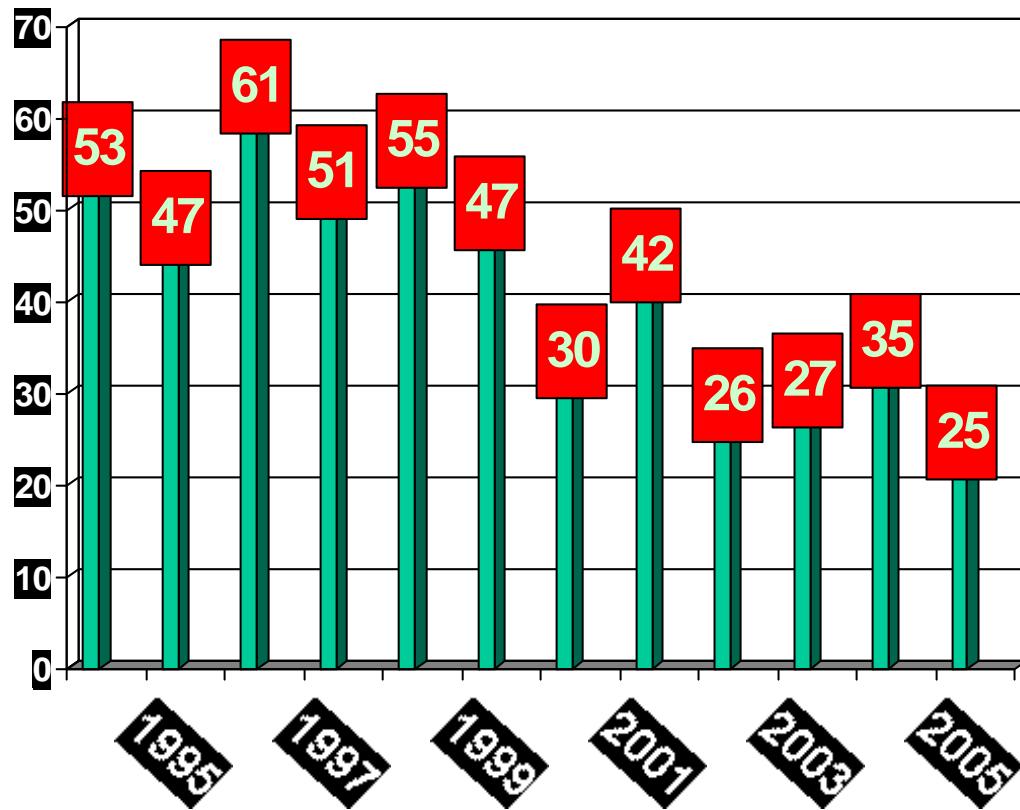


**Note: Fatalities may have several root causes.**

# Root Causes

- No Risk Assessment Conducted
- No/Inadequate Policy or Procedures
- Did not use Personal Protective Equipment
- Lack of Pre-operation Checks
- Equipment not Maintained
- Training Inadequate
- Failure to Conduct Examinations

# MNM Fatalities – 1995-2006





**The majority of fatal accidents have these common root causes**

- Failure to identify hazards
- Failure to manage risks

## **SLAM Risks the SMART Way!**

### **Miners:**

**Stop** Think through the task  
**Look** Identify the hazards for each job step  
**Analyze** Determine if you have the proper knowledge, training, and tools  
**Manage** Remove or control hazards and use proper equipment

### **Mine Operators:**

**Stop** Isolate each step in a task and identify past and potential accidents, injuries, and violations.

**Measure** Evaluate the risks associated with the task and barriers that have allowed hazards to cause injuries

**Act** Implement controls to minimize or eliminate any hazards that make the risk unacceptable

**Review** Conduct frequent work site visits to observe work practices and audit accidents, injuries, and violations to identify root causes

**Train** Develop a human factor-based action plan and then involve and train the miners

**Make the RIGHT Decision!**

# New procedures in New Mexico

- Landmark mine safety legislation was signed by Governor Richardson in March 2006
  - House Bill 687 and Senate Bill 628
- Mine Inspector has established the Mine Accident Emergency Operations Center
  - (866) 761-6039
  - New Mexico Tech
- Requires mines to prepare and file emergency notification plans and that establish a process for notifying the State when mine accidents occur

# New procedures in New Mexico

- Mine operators to report accidents to the State within 30 minutes of the event
- Underground mines to provide communications equipment and additional breathing apparatus to underground miners

# *Safety Belts*

*“Always operate within design or environmental limits”*

*“Always operate in a safe and controlled condition”*

*“Always ensure safety devices are in place and functioning”*

*“Always follow safe work practices and procedures”*

# **Tenets of Operation Slogans**

*“DO IT SAFELY OR NOT AT ALL”*

*“THERE IS ALWAYS TIME TO DO IT RIGHT”*

# Information found in Material Safety Data Sheets (MSDS)

An MSDS provides detailed information about a specific product, such as:

1. Identity
2. Hazardous Ingredients List
3. Physical Data and Hazards (i.e., appearance, odor, etc.)
4. Emergency/First Aid Procedures
5. Health Hazards (i.e., symptoms of overexposure)
6. Reactivity Data (i.e., conditions to avoid)

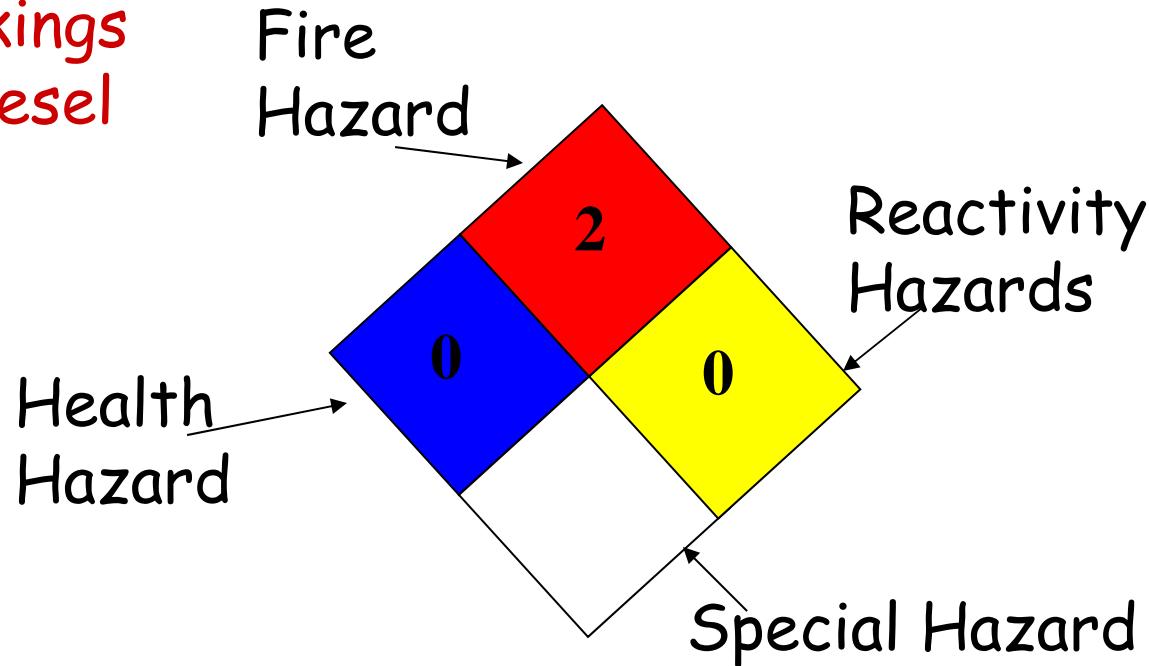
# Information found in Material Safety Data Sheets (MSDS)

- 7. Fire & Explosive Information
- 8. Spill or Leak Response Procedures
- 9. Storage & Special Precautions (i.e.,  
how to store, Personal Protective  
measures to use during handling)
- 10. Transportation Data - DOT  
regulations / Hazard class
- 11. Regulatory Information (i.e., EPA  
classifications, etc.)

# NFPA Labels

(National Fire Protection Association)

Hazard  
Rankings  
Ex. Diesel  
Fuel



0 = Minimum   1 = Slight   2 = Moderate   3 = Serious   4 = Severe

# Traffic Patterns



**What are the KEYS to good communication?**

**FOCUS!**

**ATTENTION!**

**UNDERSTANDING!**

# Ground control, highwalls, pits, stock piles and spoil banks

- Inspect your work area and be alert to any changes in the highwall or stock pile.
- Weather, local geology, size of material and rate of mining effect highwall and stock pile stability.



# Water Hazards

- **Working around water presents an additional hazard, drowning.**
- **Life jackets, fall protection and other precautions must be taken when working near water hazards.**

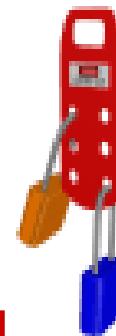


# Water Hazards

**30 CFR Part 56.15020**

**Life jackets or belts shall be worn where there is a danger from falling into water**

# Electrical Hazards



- **What electrical equipment do you have at your work place?**
- **Only qualified persons should perform electrical work.**
- **Lock-out/tag-out policy**
- **You must be aware of all sources of hazardous energy and know how to control them.**

# Personal Protective Equipment

Designed for human protection

Approved for specific  
applications

When something goes wrong, can  
be the difference between first  
aid and a medical emergency

# Personal Protective Equipment

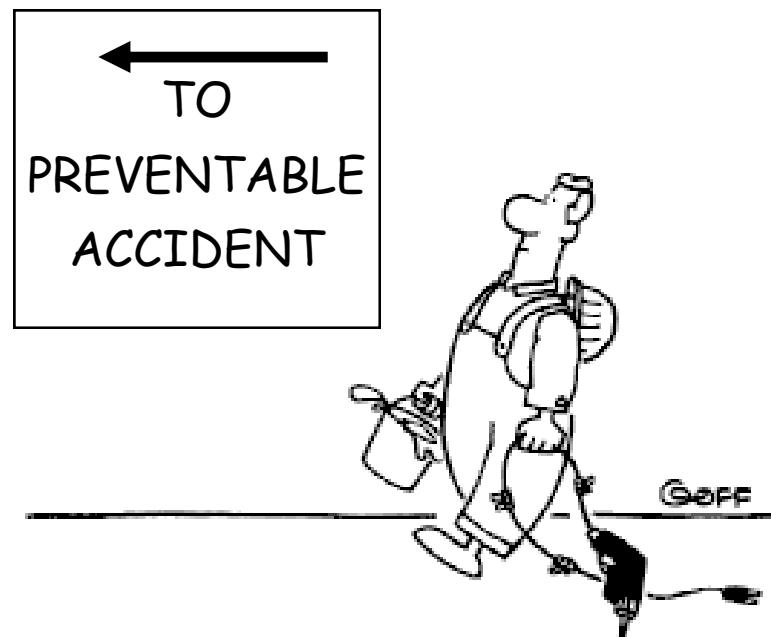
- Snug Fitting Clothing
- Hard Hat
- Safety Shoes
- Safety Glasses
- Hearing Protection
- Respirators
- Personal Fall Arrest Systems (PFAS)
- Welding PPE
- Any Others?

# Personal Protective Equipment

- Any Others?
- Gloves? What will gloves protect?

# Prevention of accidents

- Hand Tool Safety
- Fall Protection
- Confined Space
- Material Handling
- Equipment Guarding
- Working Around Machinery



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## **MOST MINES HAVE A SITE HEALTH AND SAFETY PLAN (HASP)**

**To provide a safe and healthful work place**

**Plan on what to do in case something goes wrong!**

**Site specific**